FIG. 1

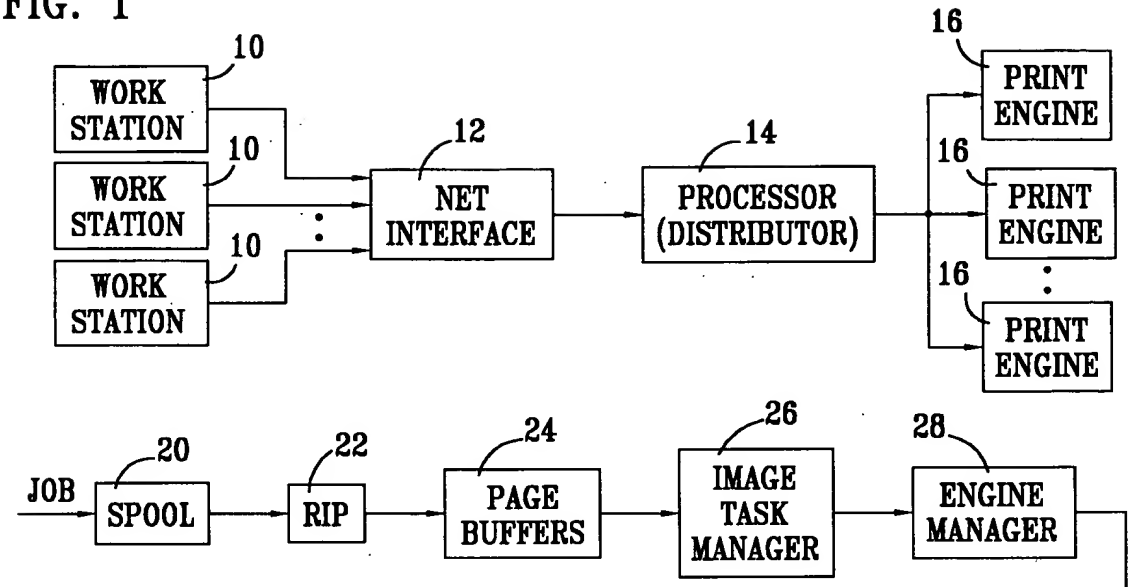


FIG. 2

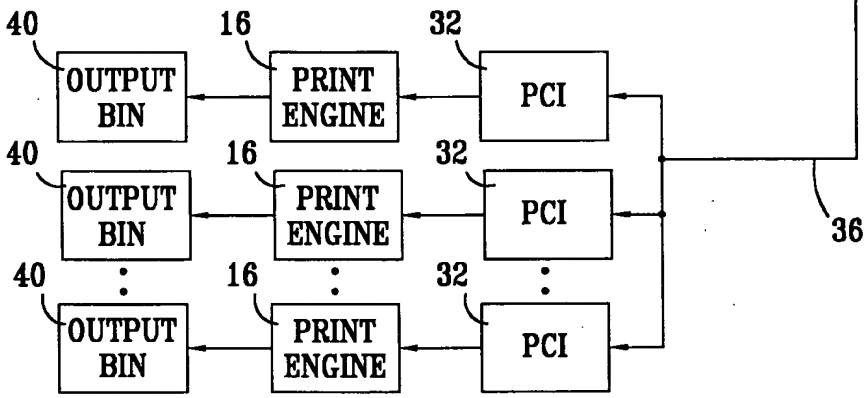


FIG. 3a

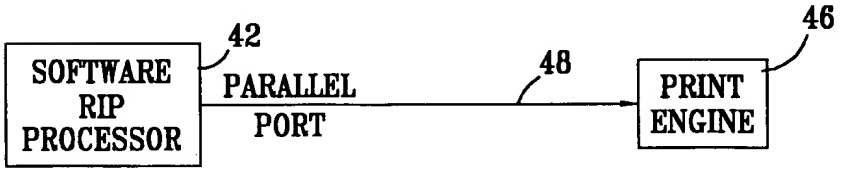


FIG. 3b

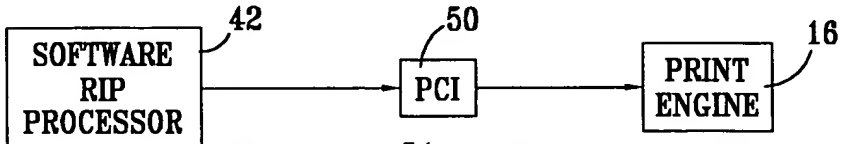
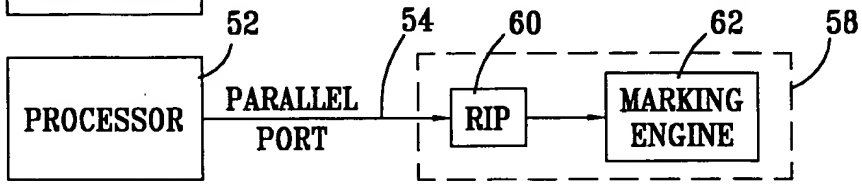


FIG. 3c



6064565 "05/30/04

FIG. 4

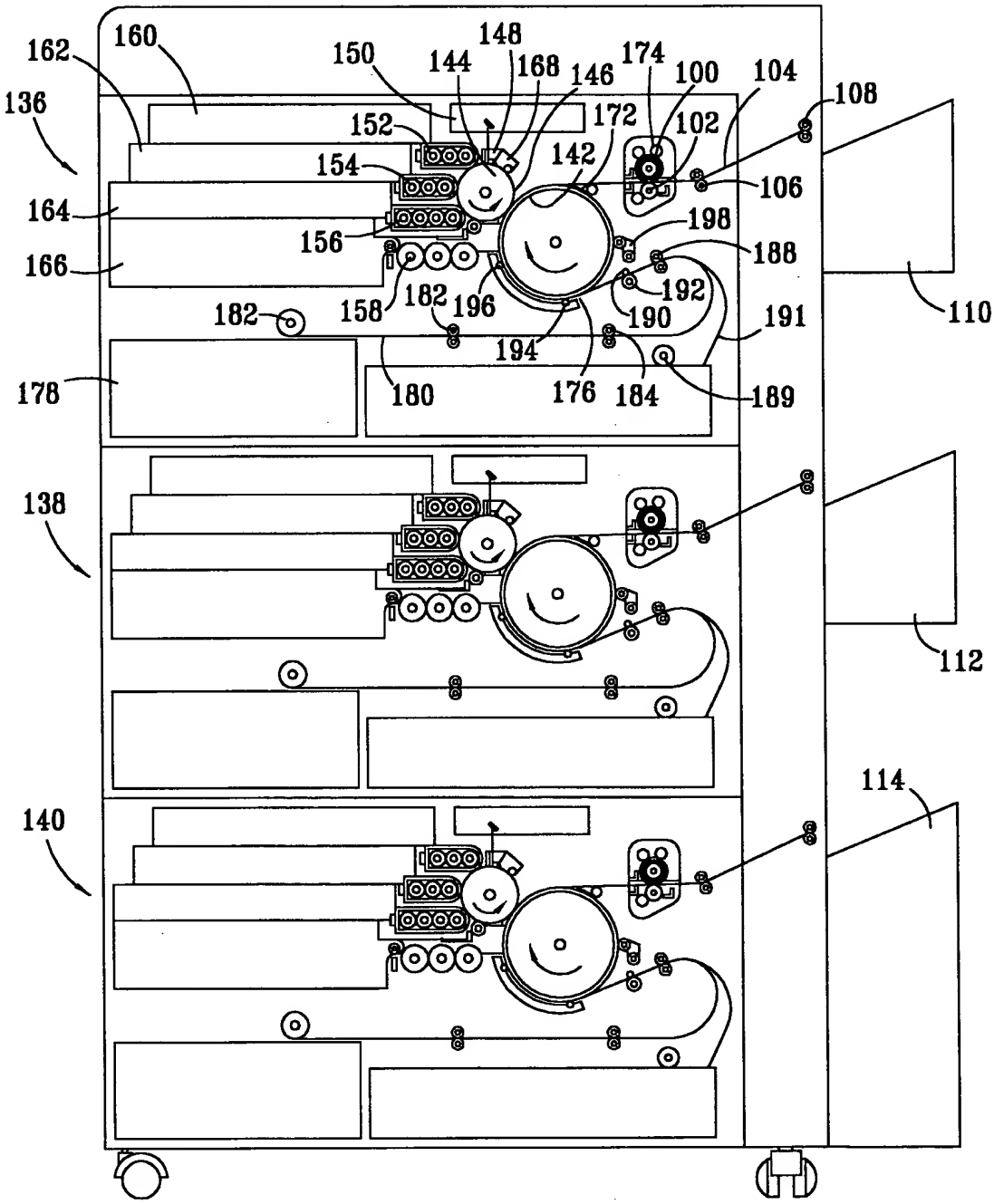

162
160
150
144
148
168
146
174
100
104
108
136
152
172
102
154
142
106
164
198
156
188
166
192
182
158
182
196
190
191
110
194
178
180
176
184
189
138
112
114
140

FIG. 5

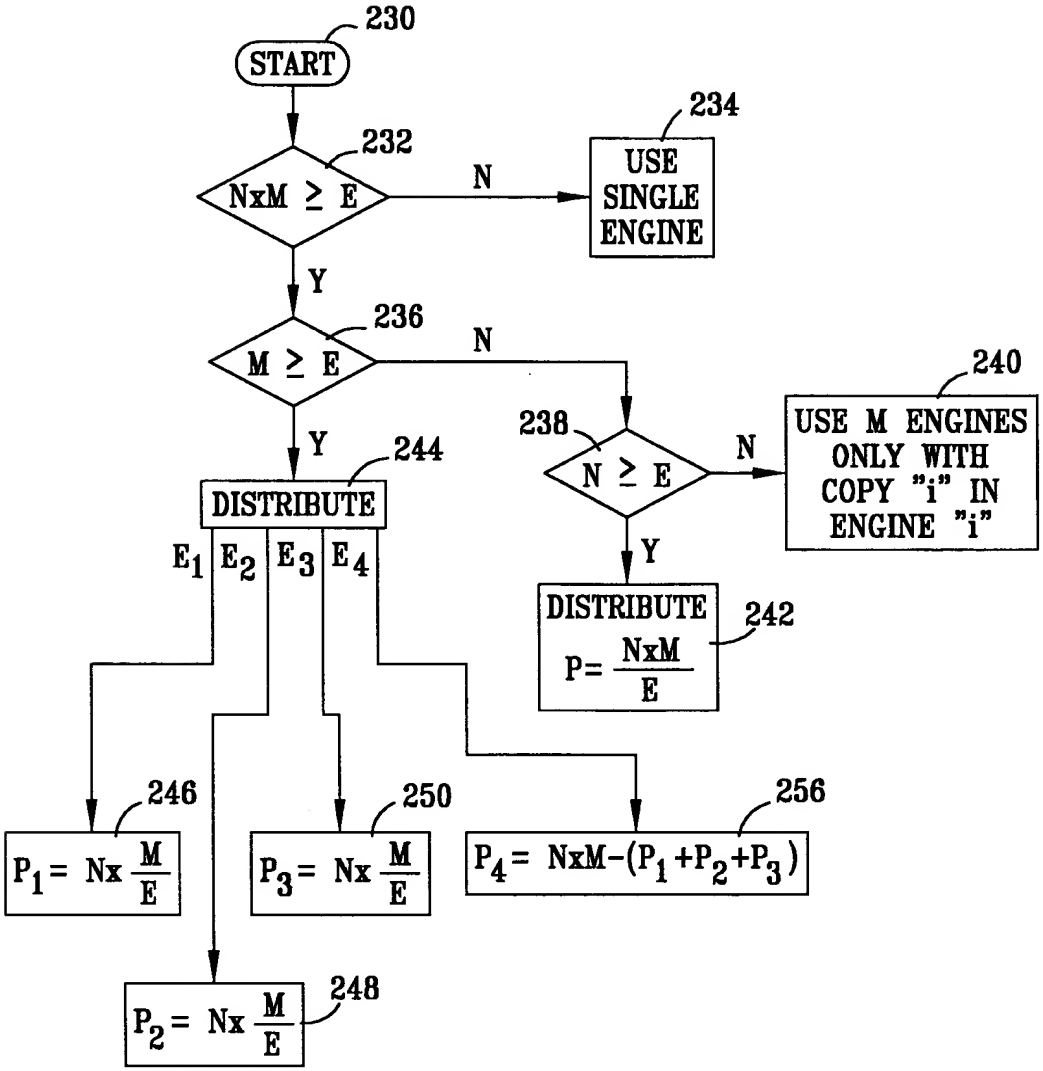

230
START
232
NxM ≥ E
N
234
USE SINGLE ENGINE
Y
236
M ≥ E
N
240
USE M ENGINES ONLY WITH COPY "i" IN ENGINE "i"
238
N ≥ E
N
Y
244
DISTRIBUTE
E1 E2 E3 E4
Y
DISTRIBUTE P= NxM / E
242
246
P1= Nx M/E
250
P3= Nx M/E
256
P4= NxM-(P1+P2+P3)
248
P2= Nx M/E

FIG. 6

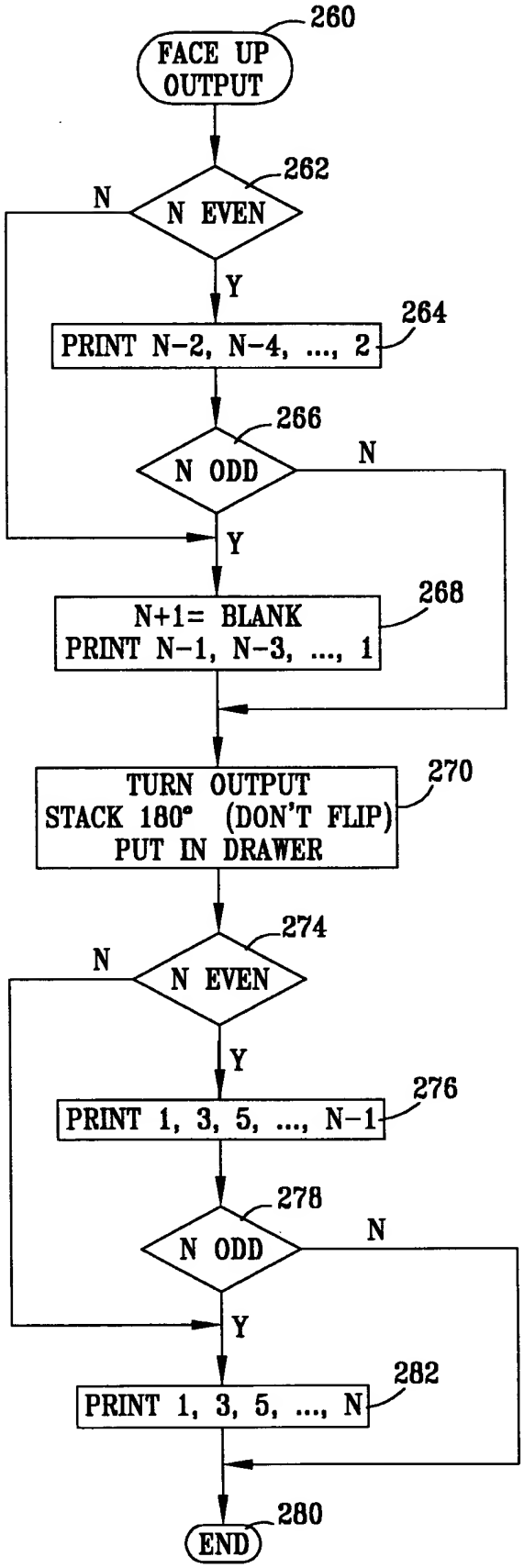

260
FACE UP OUTPUT
262
N EVEN
N
Y
264
PRINT N-2, N-4, ..., 2
266
N ODD
N
Y
268
N+1= BLANK
PRINT N-1, N-3, ..., 1
270
TURN OUTPUT STACK 180° (DON'T FLIP) PUT IN DRAWER
274
N EVEN
N
Y
276
PRINT 1, 3, 5, ..., N-1
278
N ODD
N
Y
282
PRINT 1, 3, 5, ..., N
280
END

FIG. 7

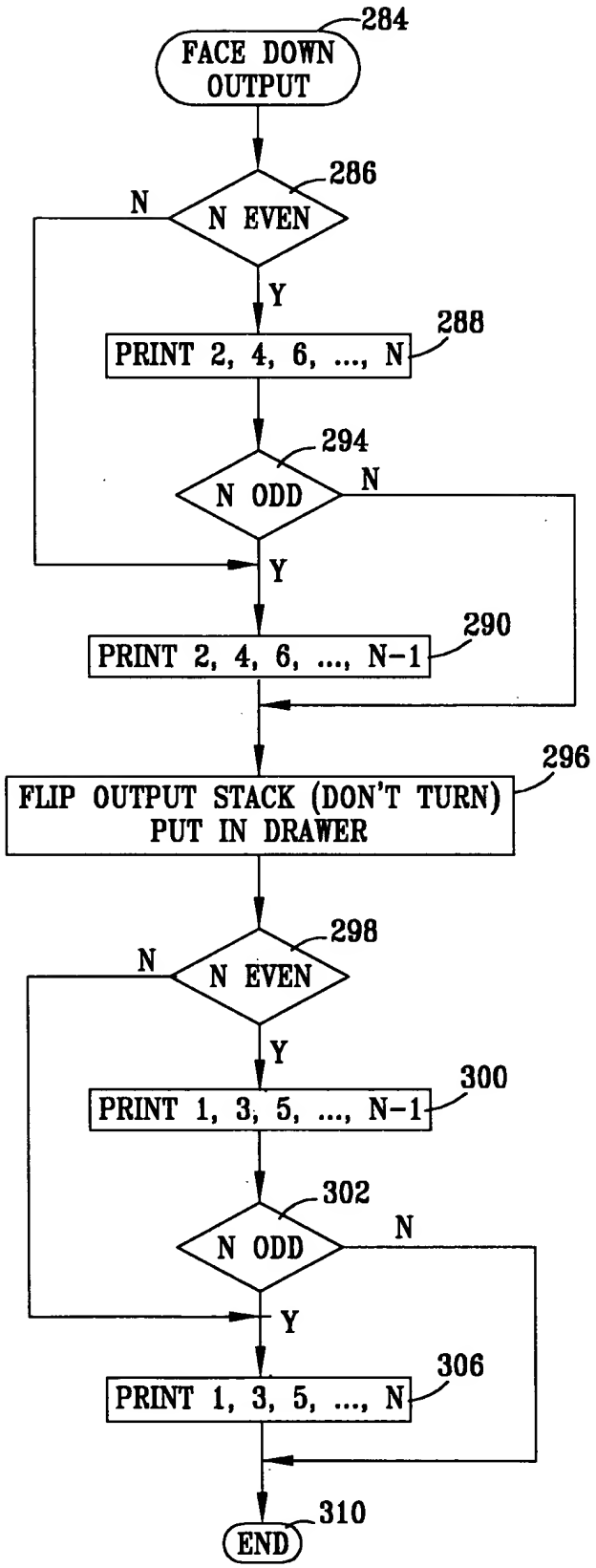


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FIG. 8

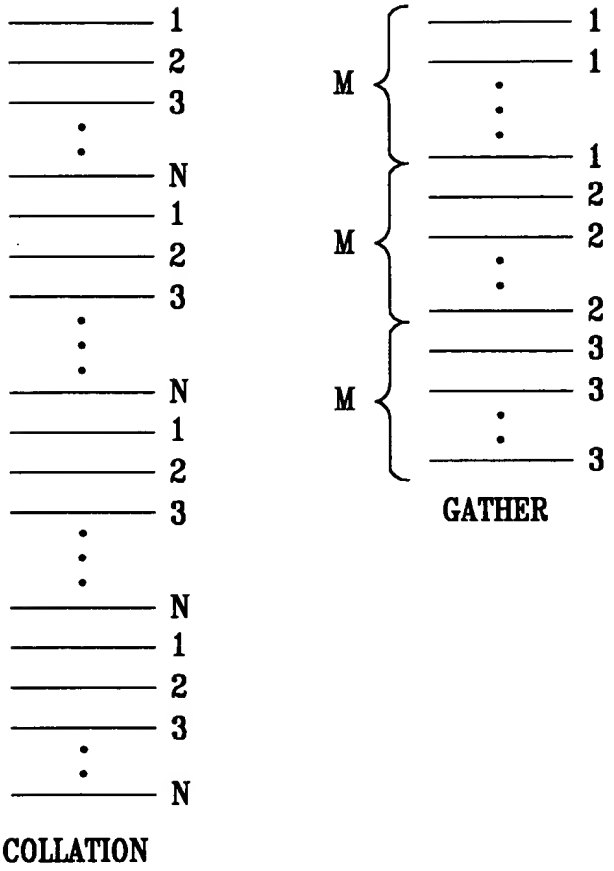
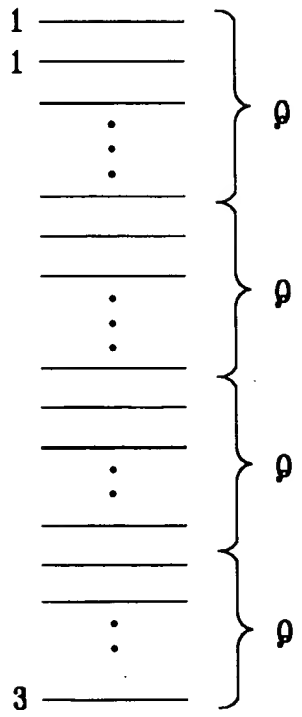


FIG. 10



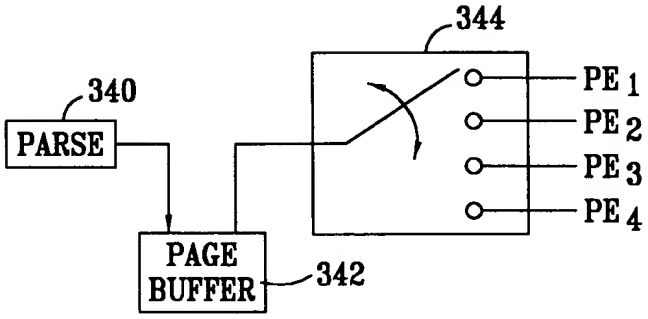


FIG. 11

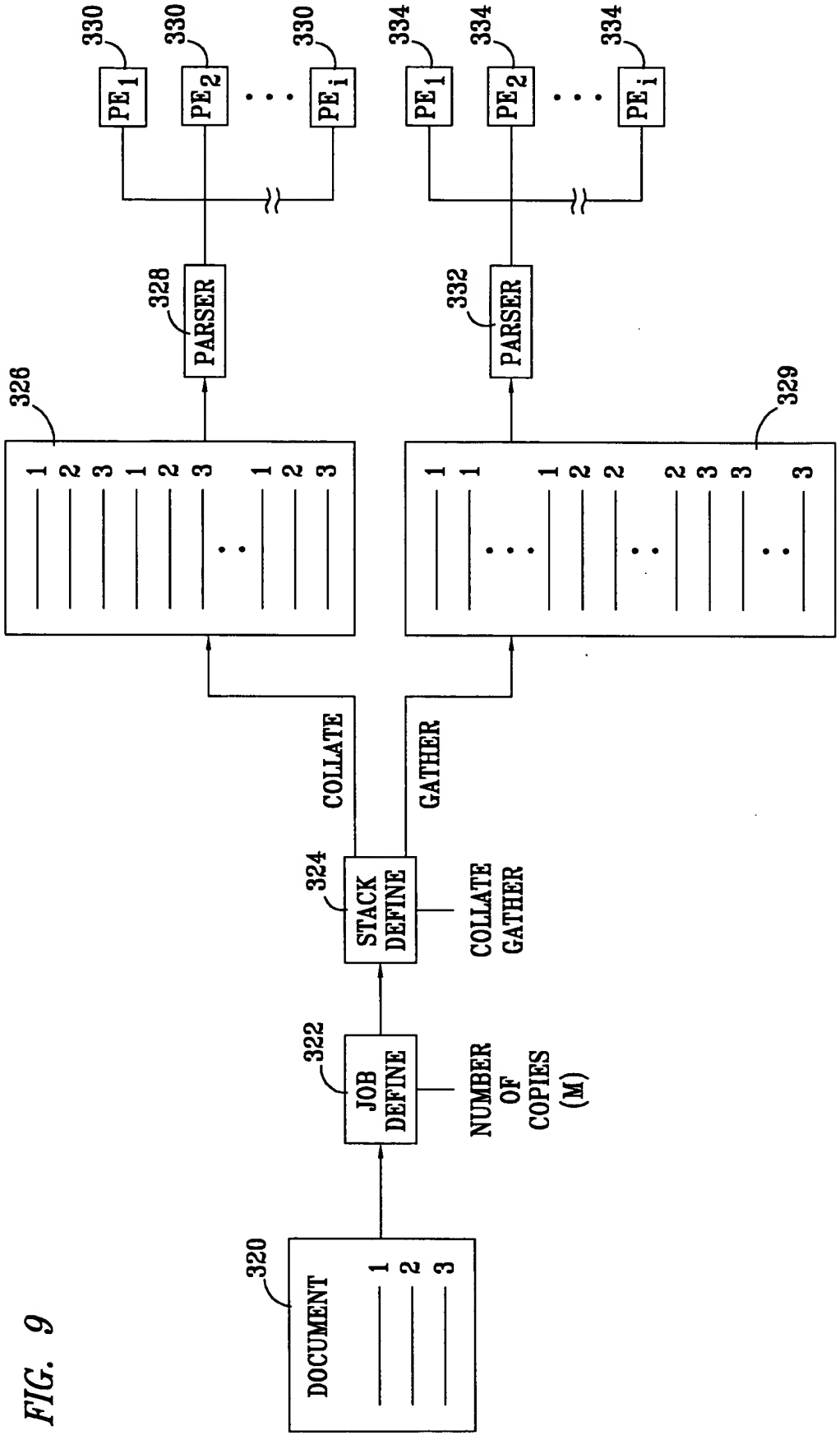

320
DOCUMENT
1
2
3
322
JOB DEFINE
NUMBER OF COPIES (M)
324
STACK DEFINE
COLLATE
GATHER
COLLATE
GATHER
326
329
328
PARSER
332
PARSER
330
PE1
PE2
PEi
334
PE1
PE2
PEi

FIG. 9

FIG. 12

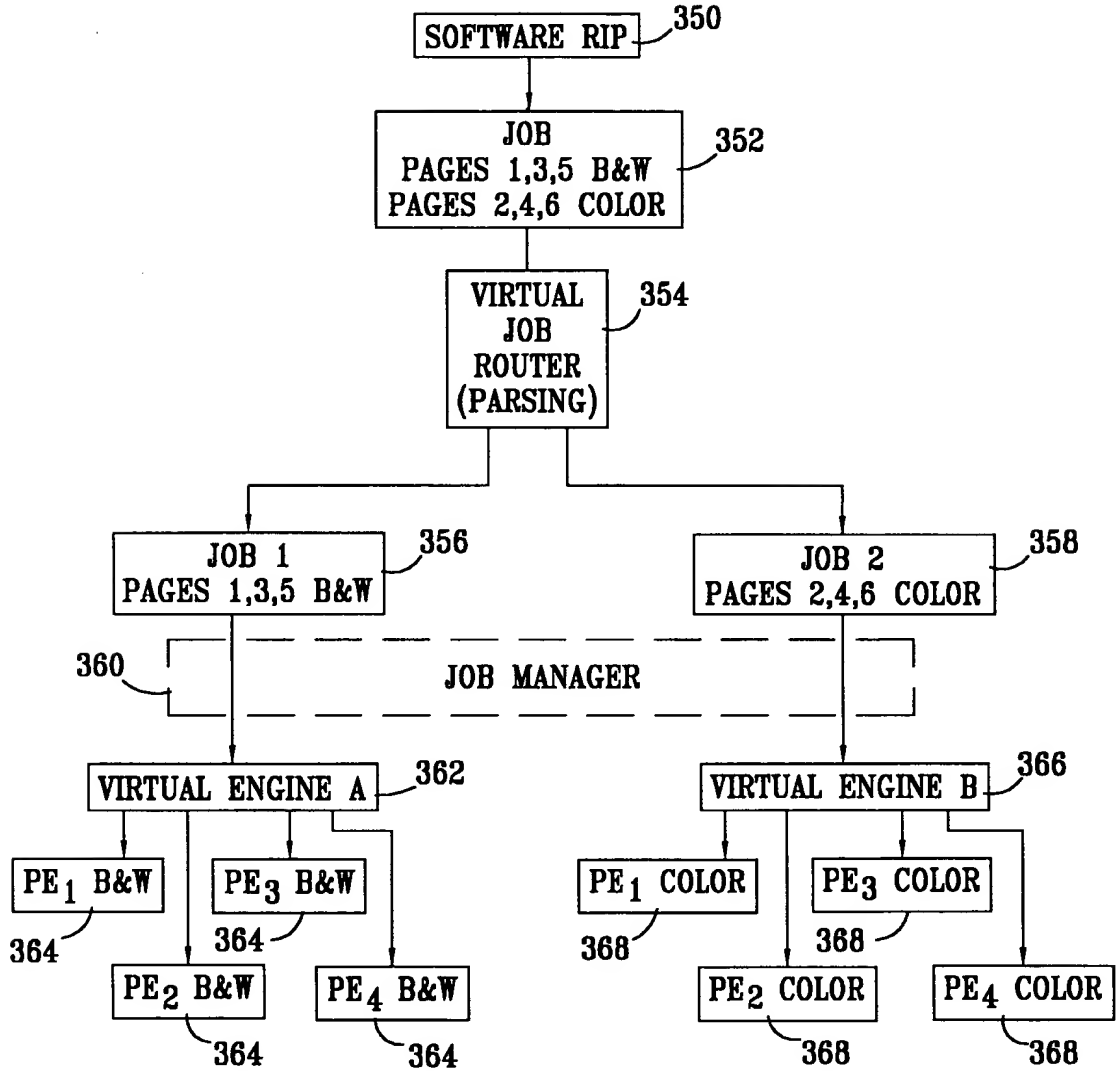
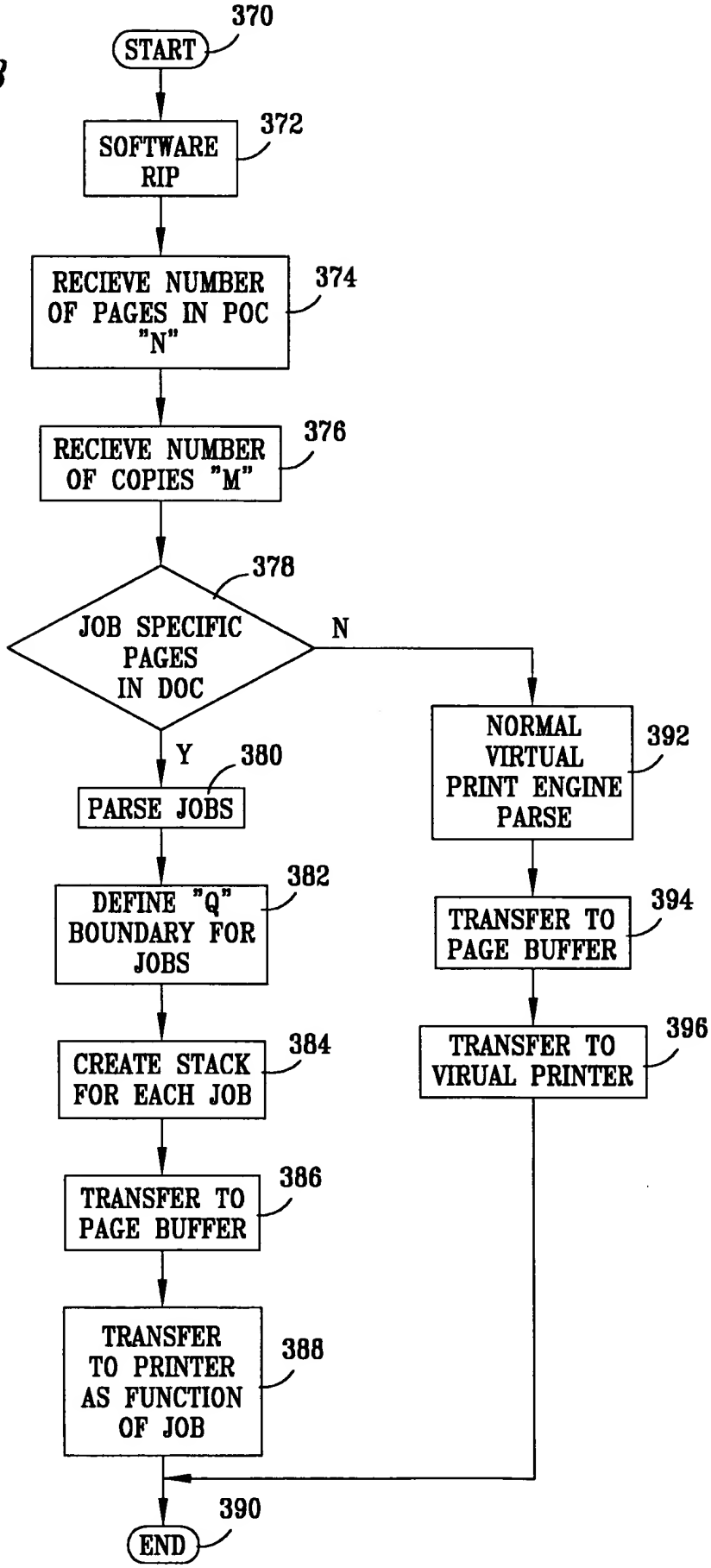

SOFTWARE RIP
350
JOB
PAGES 1,3,5 B&W
PAGES 2,4,6 COLOR
352
VIRTUAL
JOB
ROUTER
(PARSING)
354
JOB 1
PAGES 1,3,5 B&W
356
JOB 2
PAGES 2,4,6 COLOR
358
360
JOB MANAGER
VIRTUAL ENGINE A
362
VIRTUAL ENGINE B
366
PE1 B&W
364
PE3 B&W
364
PE2 B&W
364
PE4 B&W
364
PE1 COLOR
368
PE3 COLOR
368
PE2 COLOR
368
PE4 COLOR
368

FIG. 13


370
START
372
SOFTWARE RIP
374
RECIEVE NUMBER OF PAGES IN POC "N"
376
RECIEVE NUMBER OF COPIES "M"
378
JOB SPECIFIC PAGES IN DOC
N
Y
380
PARSE JOBS
382
DEFINE "Q" BOUNDARY FOR JOBS
384
CREATE STACK FOR EACH JOB
386
TRANSFER TO PAGE BUFFER
388
TRANSFER TO PRINTER AS FUNCTION OF JOB
390
END
392
NORMAL VIRTUAL PRINT ENGINE PARSE
394
TRANSFER TO PAGE BUFFER
396
TRANSFER TO VIRUAL PRINTER

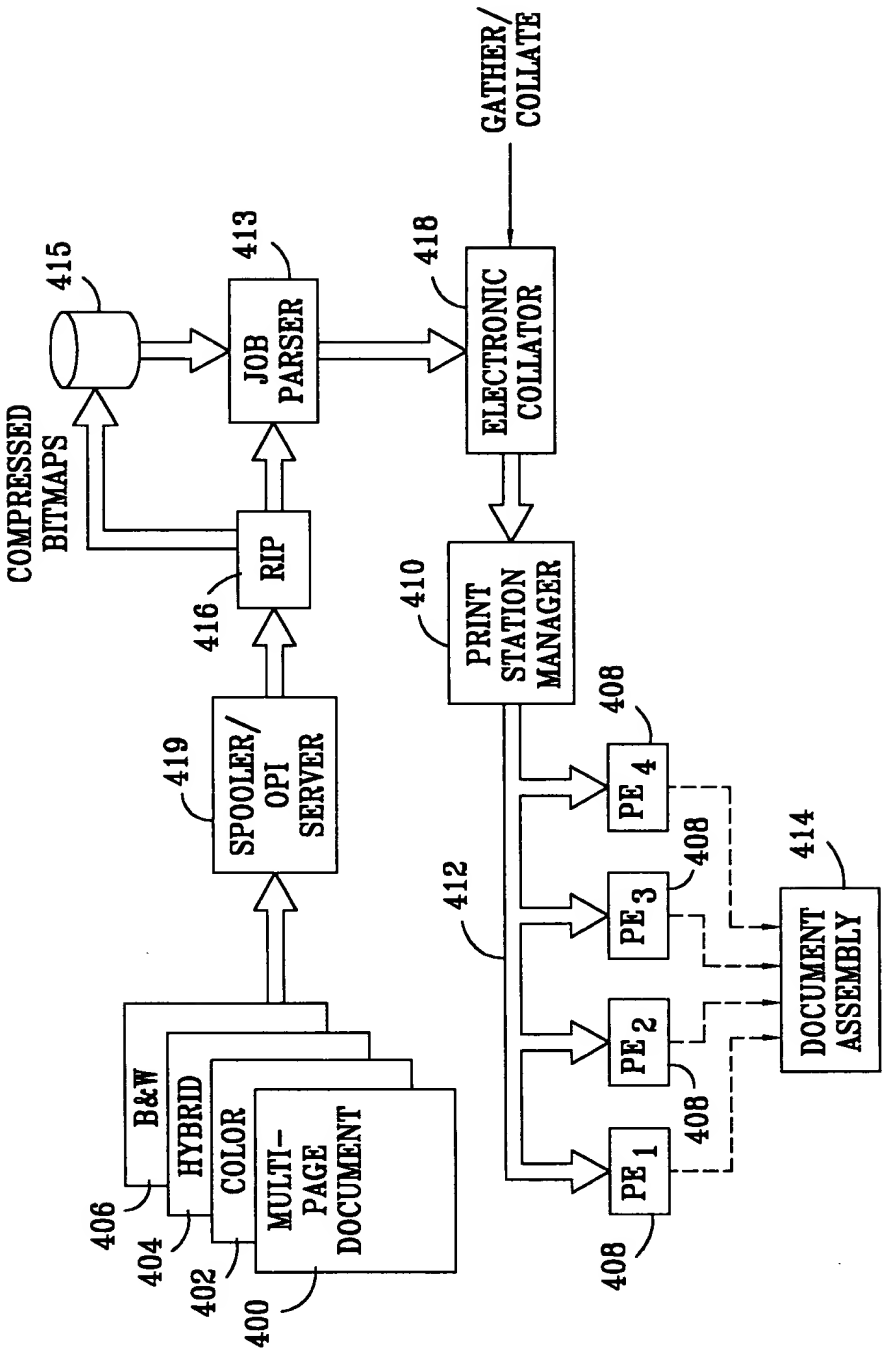

GATHER/
COLLATE
415
413
418
JOB
PARSER
ELECTRONIC
COLLATOR
COMPRESSED
BITMAPS
RIP
416
410
PRINT
STATION
MANAGER
419
SPOOLER/
OPI
SERVER
408
PE 4
408
PE 3
412
414
DOCUMENT
ASSEMBLY
PE 2
408
PE 1
408
406
B&W
404
HYBRID
402
COLOR
400
MULTI-
PAGE
DOCUMENT

FIG. 14

FIG. 15

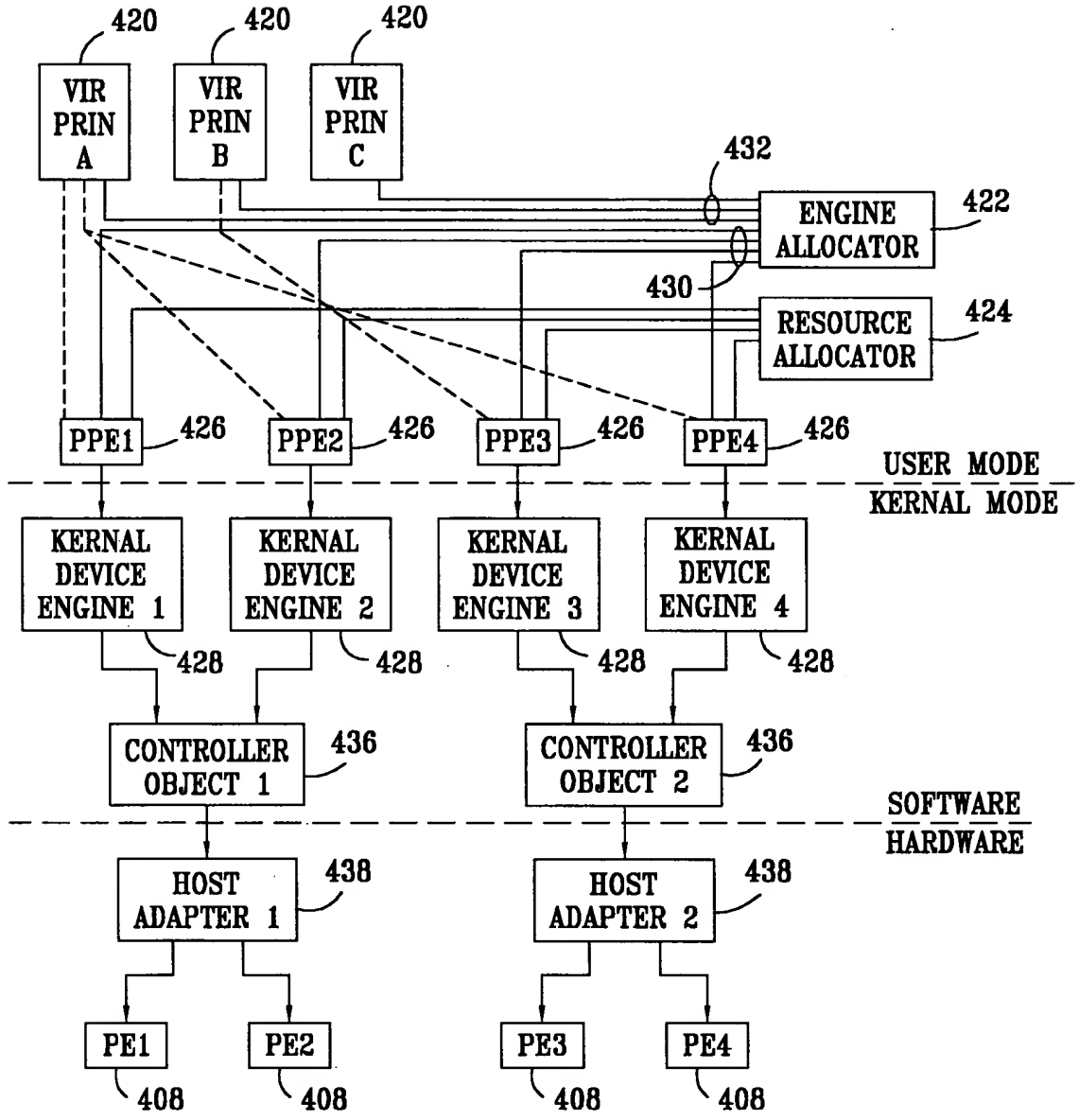

420
420
420
VIR PRIN A
VIR PRIN B
VIR PRIN C
432
ENGINE ALLOCATOR
422
430
RESOURCE ALLOCATOR
424
PPE1
426
PPE2
426
PPE3
426
PPE4
426
USER MODE
KERNAL MODE
KERNAL DEVICE ENGINE 1
KERNAL DEVICE ENGINE 2
KERNAL DEVICE ENGINE 3
KERNAL DEVICE ENGINE 4
428
428
428
428
CONTROLLER OBJECT 1
436
CONTROLLER OBJECT 2
436
SOFTWARE
HARDWARE
HOST ADAPTER 1
438
HOST ADAPTER 2
438
PE1
PE2
PE3
PE4
408
408
408
408

FIG. 16

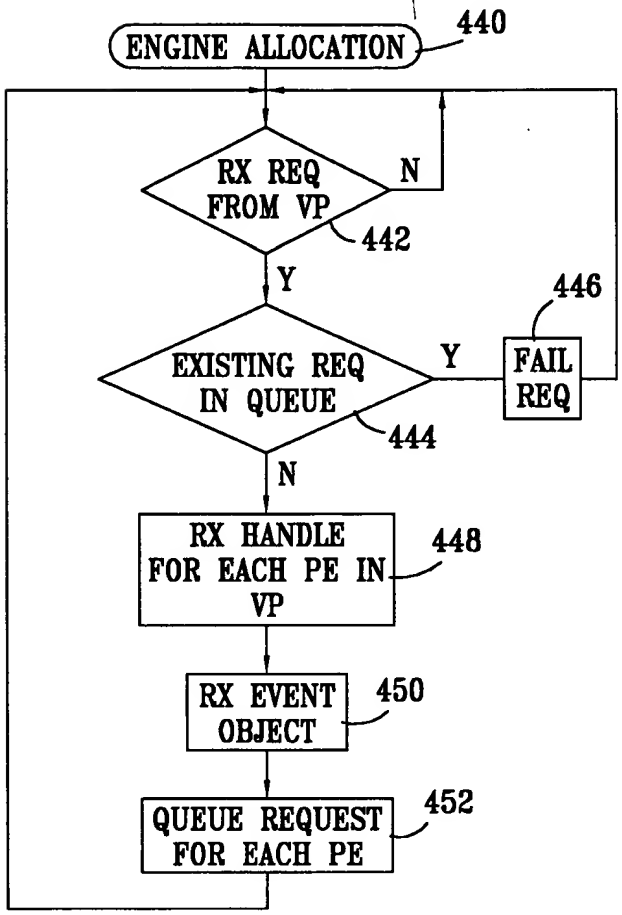


FIG. 17

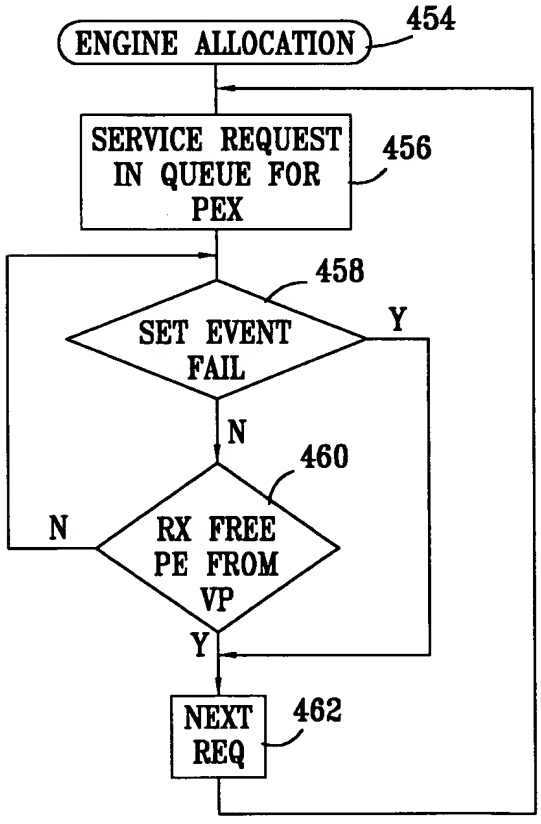


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FIG. 18

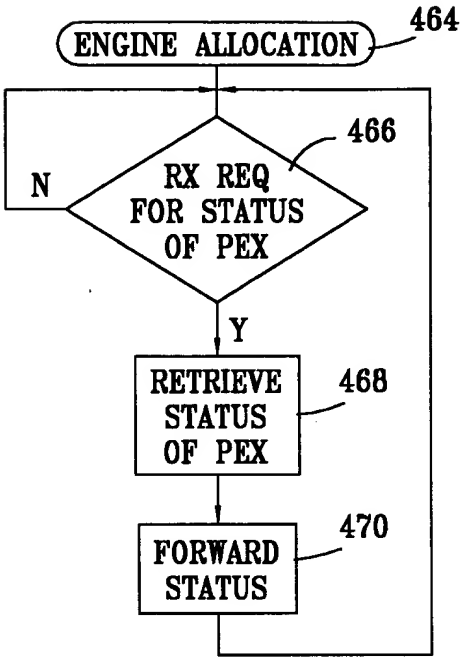

ENGINE ALLOCATION
464
RX REQ FOR STATUS OF PEX
466
N
Y
RETRIEVE STATUS OF PEX
468
FORWARD STATUS
470

FIG. 19

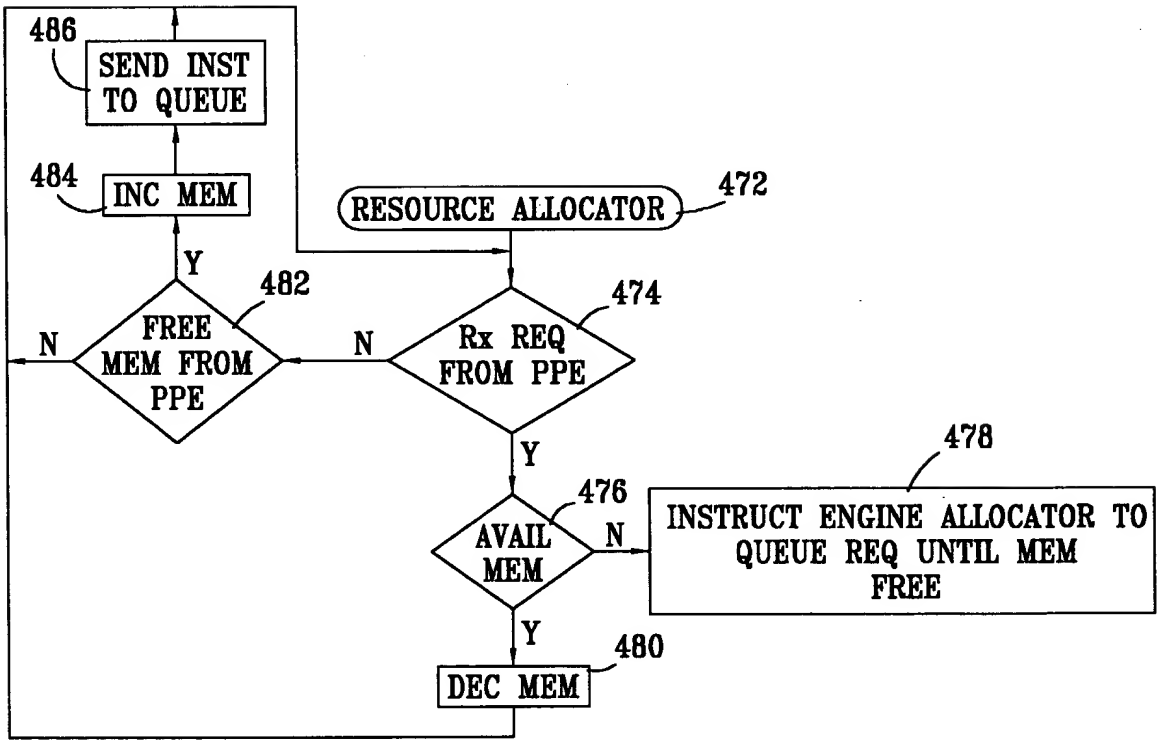

486
SEND INST TO QUEUE
484
INC MEM
Y
RESOURCE ALLOCATOR
472
482
FREE MEM FROM PPE
N
N
Rx REQ FROM PPE
474
Y
478
476
AVAIL MEM
N
INSTRUCT ENGINE ALLOCATOR TO QUEUE REQ UNTIL MEM FREE
Y
480
DEC MEM

FIG. 20
PRIOR ART

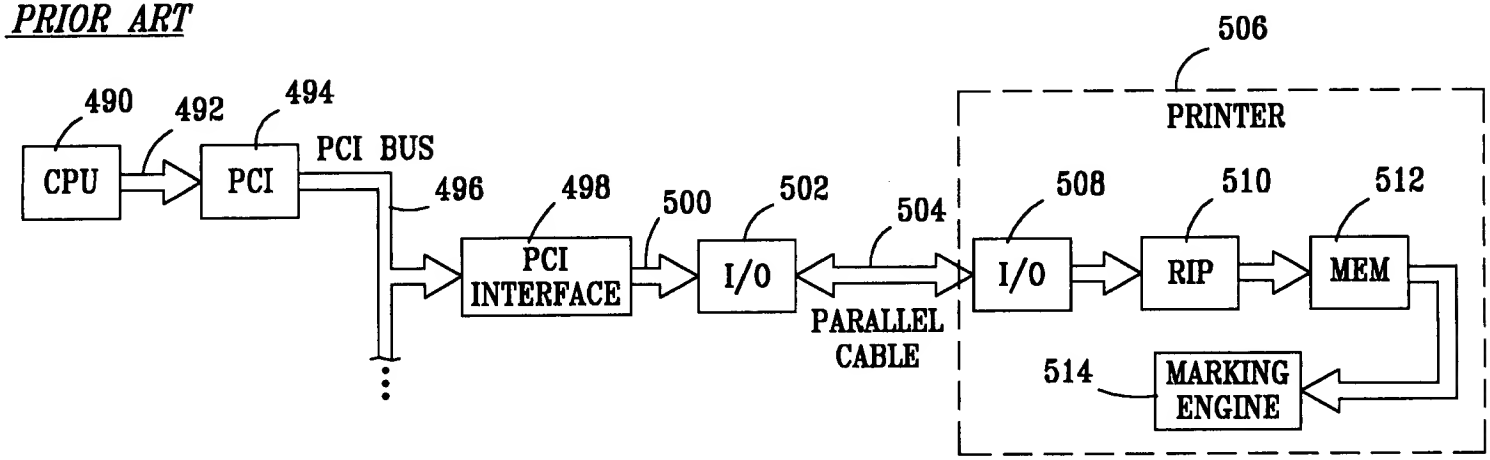


FIG. 21

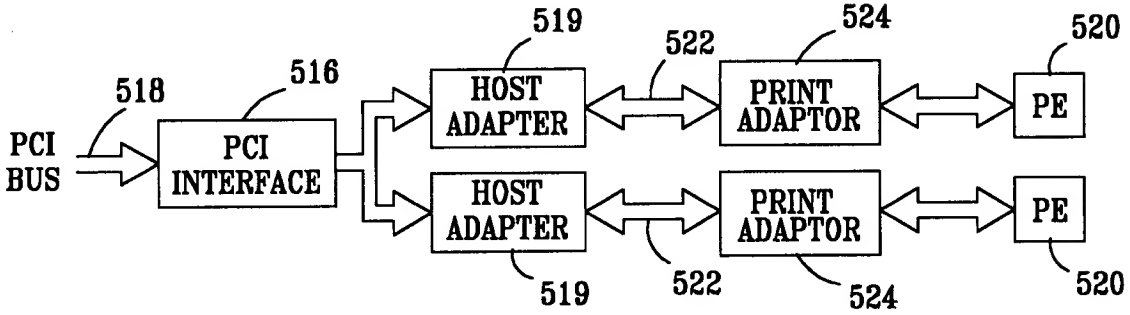


FIG. 22

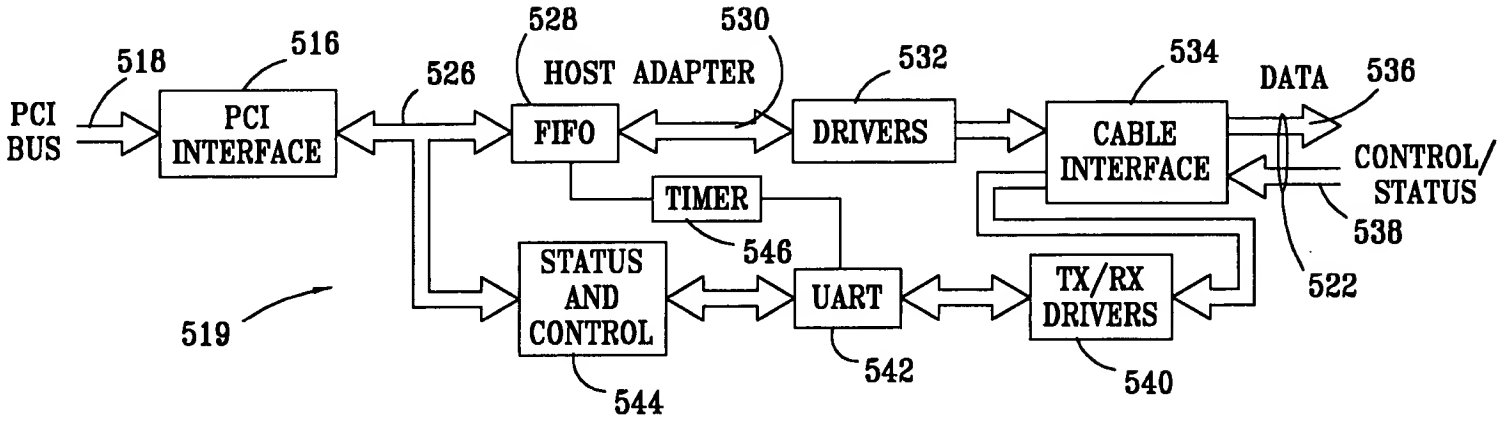


FIG. 23

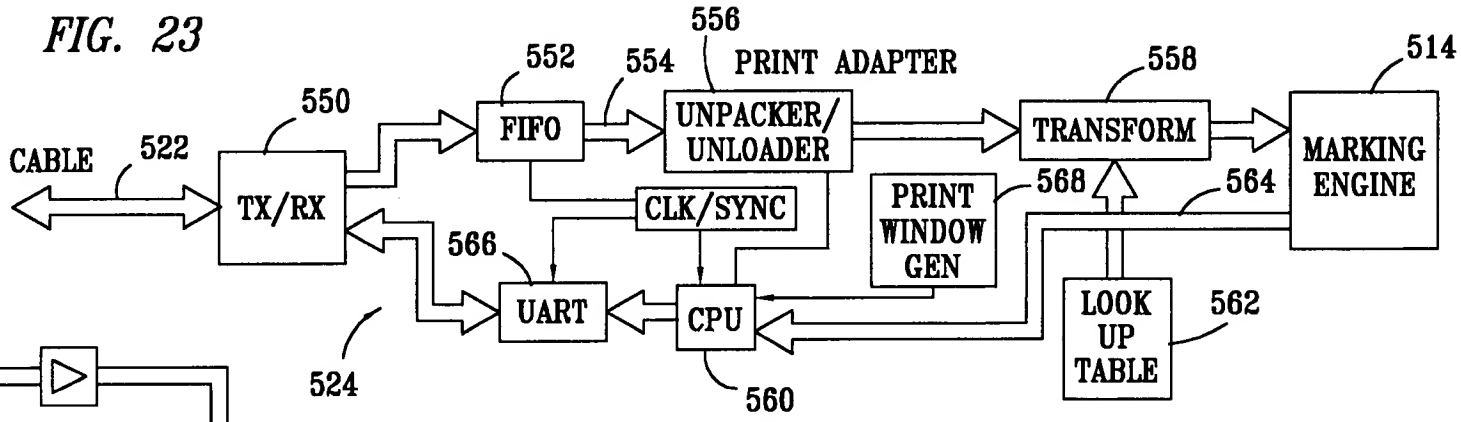


FIG. 23a

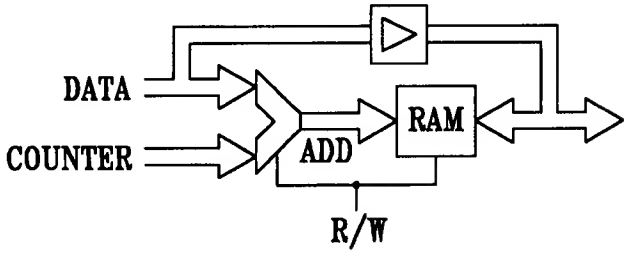
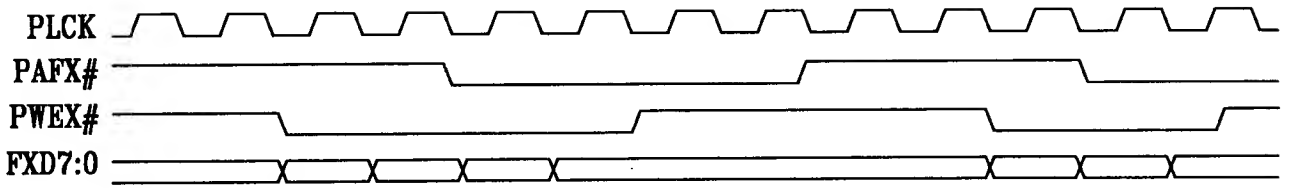


FIG. 24



HOST FIFO UNLOAD, PRINTER AF FLAG TOGGLING

FIG. 25
PRIOR ART

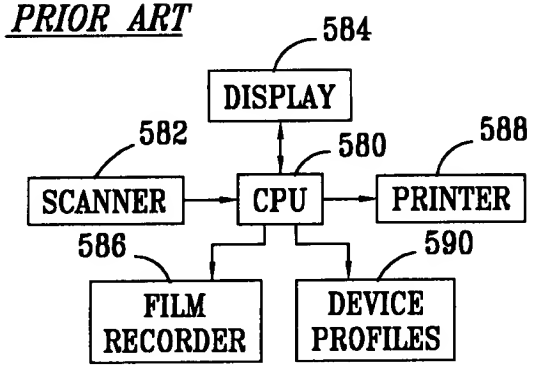


FIG. 26
PRIOR ART

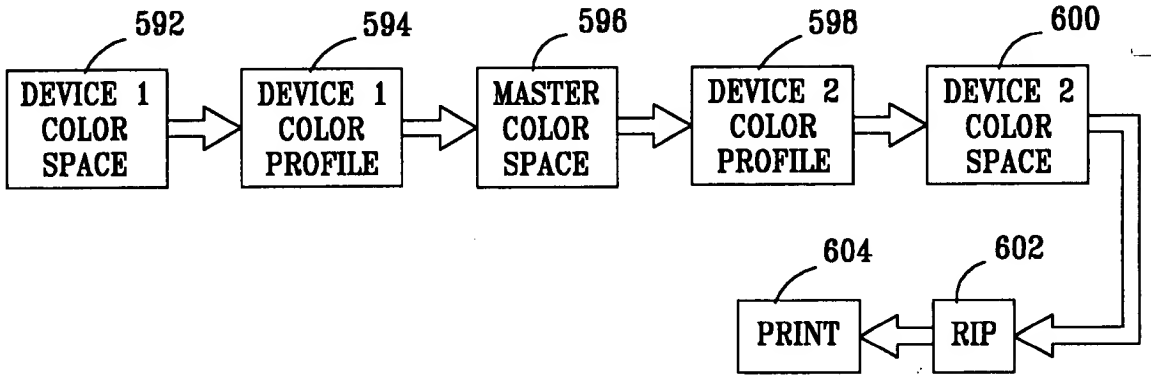


FIG. 27

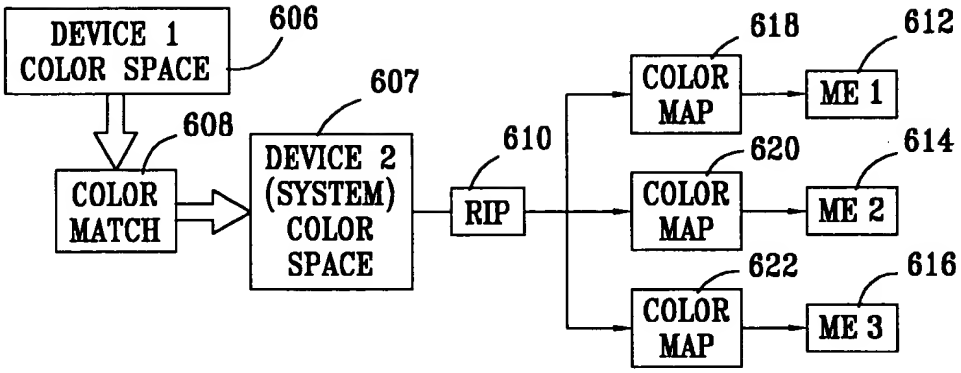

DEVICE 1 COLOR SPACE
606
COLOR MATCH
608
DEVICE 2 (SYSTEM) COLOR SPACE
607
RIP
610
COLOR MAP
618
ME 1
612
COLOR MAP
620
ME 2
614
COLOR MAP
622
ME 3
616

FIG. 28

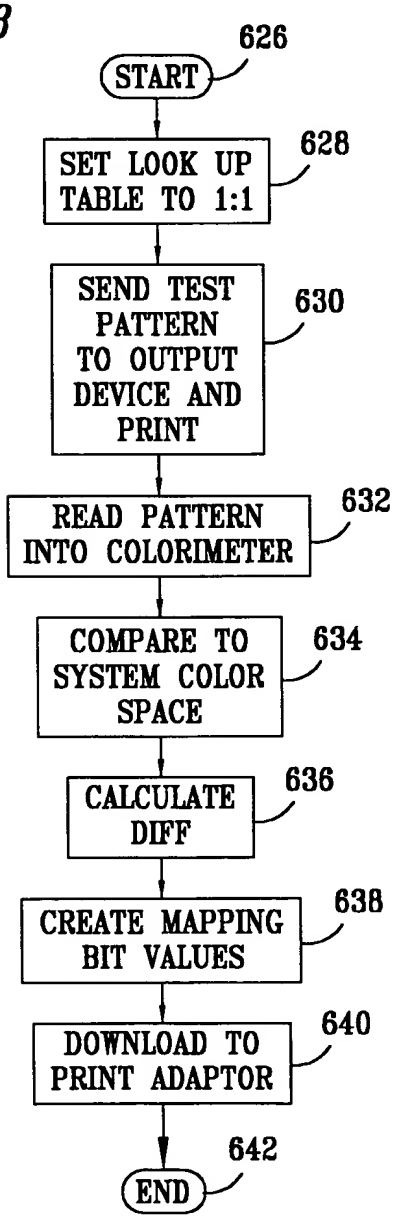

START
626
SET LOOK UP TABLE TO 1:1
628
SEND TEST PATTERN TO OUTPUT DEVICE AND PRINT
630
READ PATTERN INTO COLORIMETER
632
COMPARE TO SYSTEM COLOR SPACE
634
CALCULATE DIFF
636
CREATE MAPPING BIT VALUES
638
DOWNLOAD TO PRINT ADAPTOR
640
END
642

FIG. 29

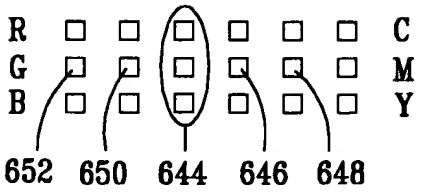


FIG. 30

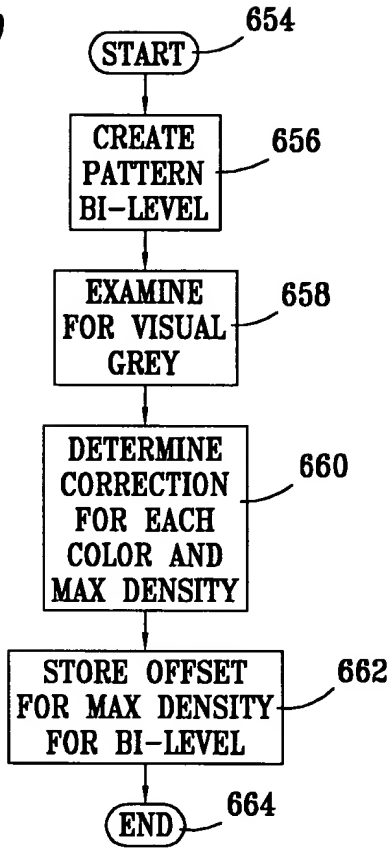


FIG. 34

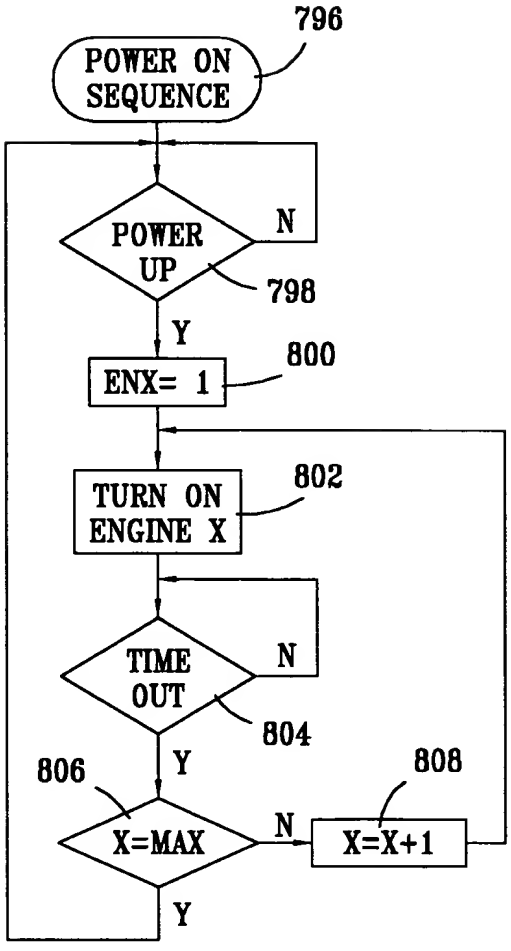


FIG. 31

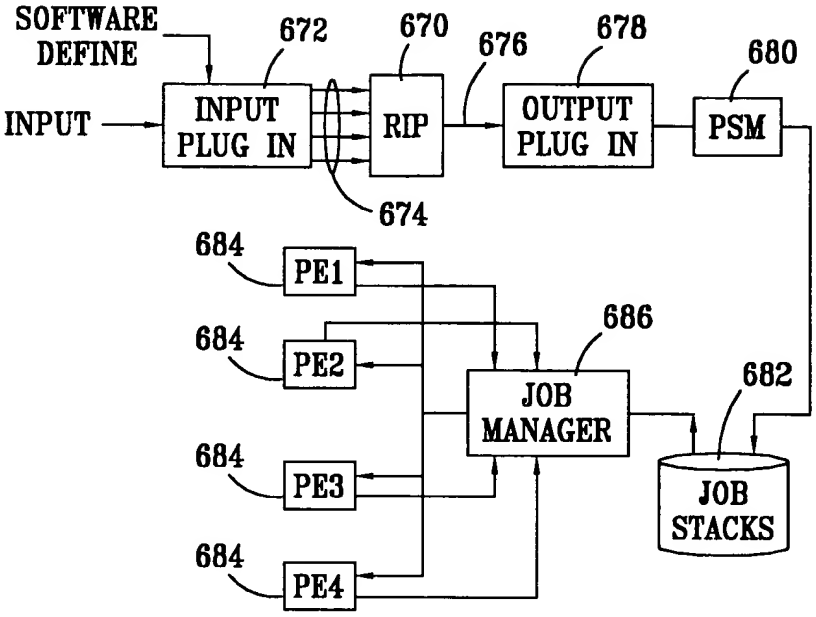

SOFTWARE DEFINE
INPUT
672
670
676
678
680
INPUT PLUG IN
RIP
OUTPUT PLUG IN
PSM
674
684
PE1
684
PE2
686
682
JOB MANAGER
684
PE3
JOB STACKS
684
PE4

FIG. 35

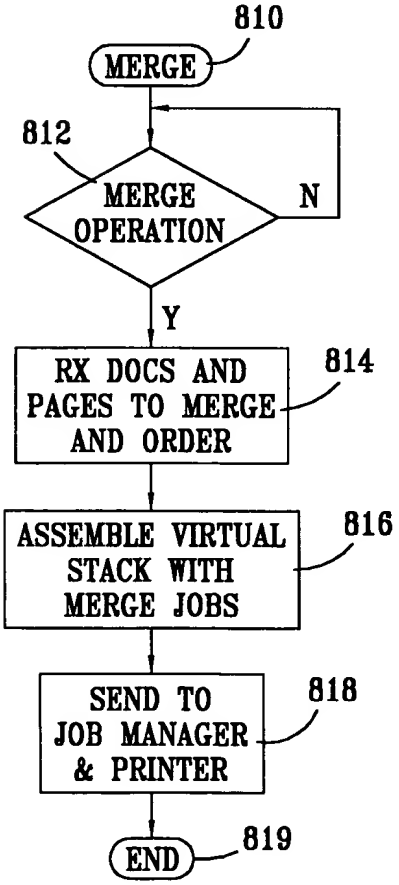

810
MERGE
812
MERGE OPERATION
N
Y
RX DOCS AND PAGES TO MERGE AND ORDER
814
ASSEMBLE VIRTUAL STACK WITH MERGE JOBS
816
SEND TO JOB MANAGER & PRINTER
818
END
819

FIG. 32

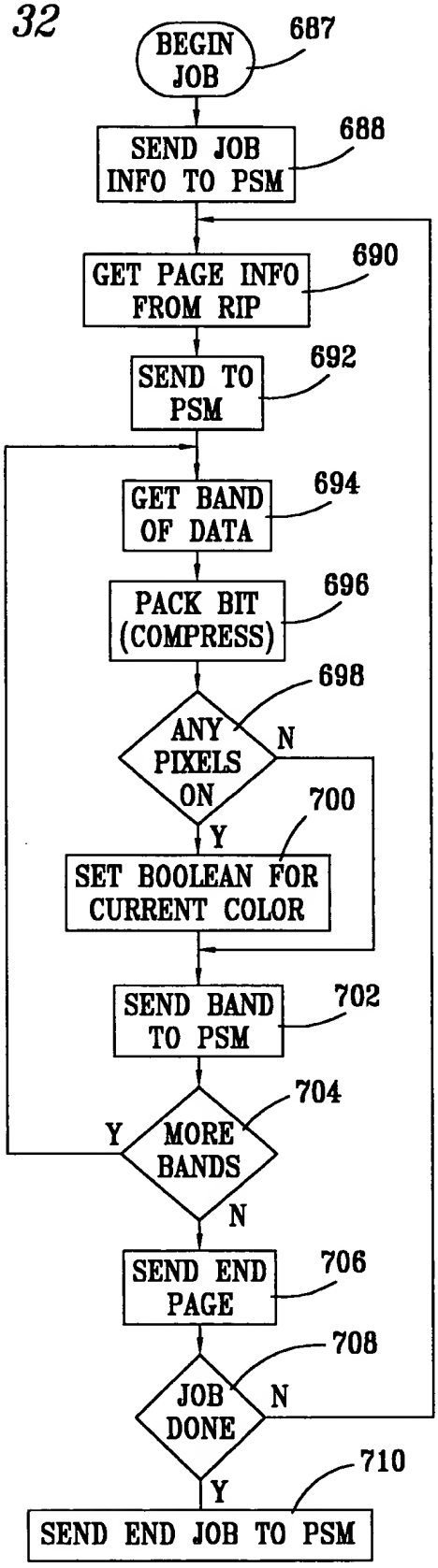

BEGIN JOB
687
SEND JOB INFO TO PSM
688
GET PAGE INFO FROM RIP
690
SEND TO PSM
692
GET BAND OF DATA
694
PACK BIT (COMPRESS)
696
ANY PIXELS ON
698
N
Y
SET BOOLEAN FOR CURRENT COLOR
700
SEND BAND TO PSM
702
MORE BANDS
704
Y
N
SEND END PAGE
706
JOB DONE
708
N
Y
SEND END JOB TO PSM
710

FIG. 33

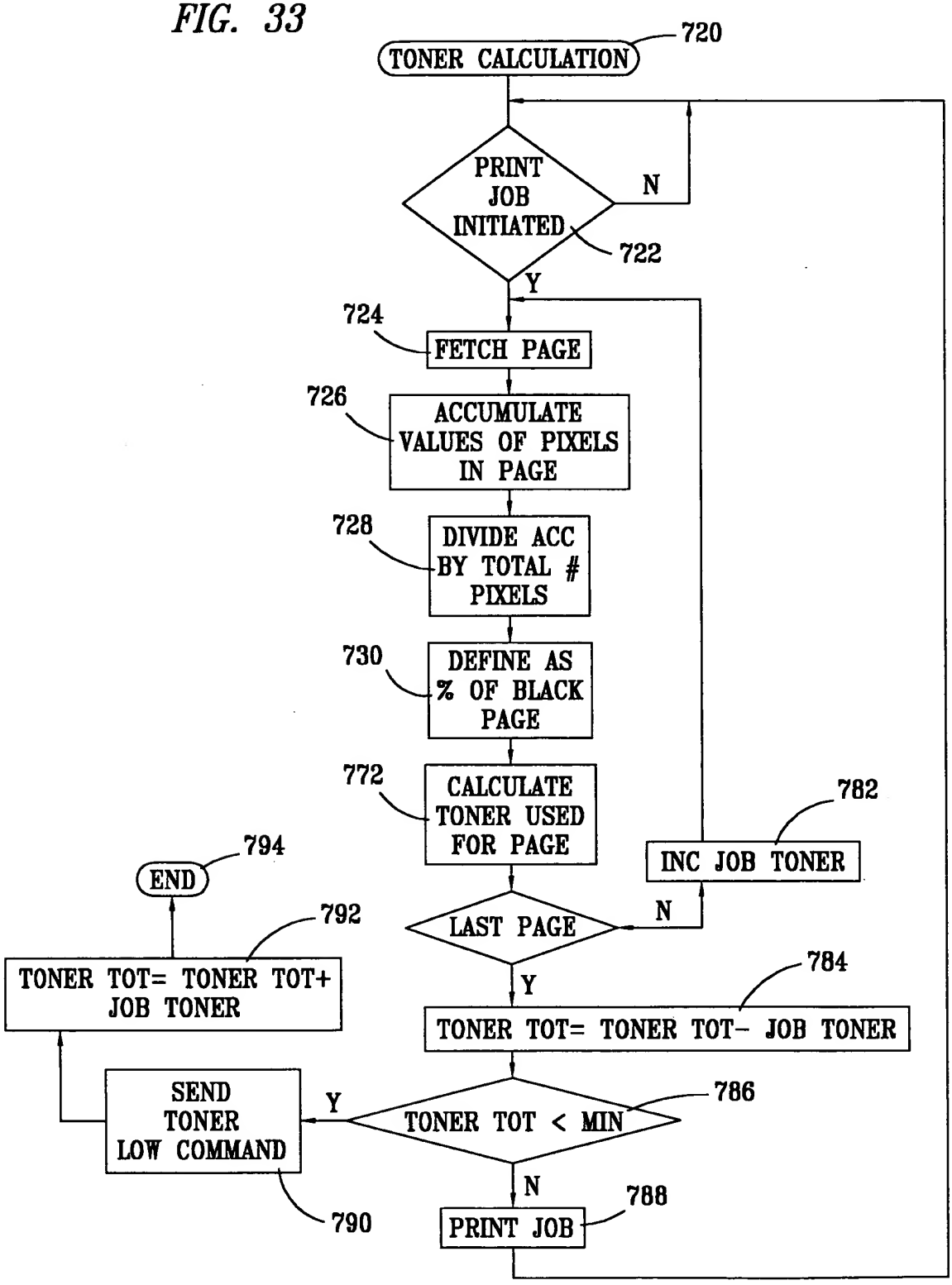
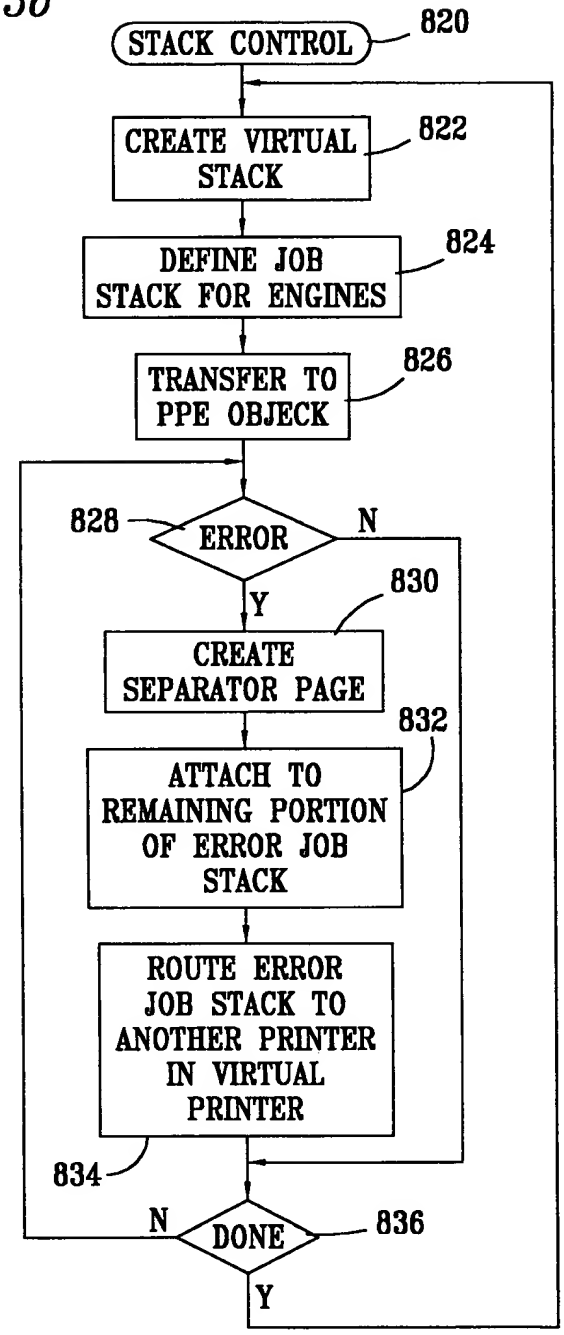

TONER CALCULATION
720
PRINT JOB INITIATED
722
N
Y
724
FETCH PAGE
726
ACCUMULATE VALUES OF PIXELS IN PAGE
728
DIVIDE ACC BY TOTAL # PIXELS
730
DEFINE AS % OF BLACK PAGE
772
CALCULATE TONER USED FOR PAGE
782
INC JOB TONER
LAST PAGE
N
Y
784
TONER TOT= TONER TOT- JOB TONER
786
TONER TOT < MIN
Y
N
788
PRINT JOB
SEND TONER LOW COMMAND
790
792
TONER TOT= TONER TOT+ JOB TONER
794
END

FIG. 36



Docket #: 25,474

FIG. 37

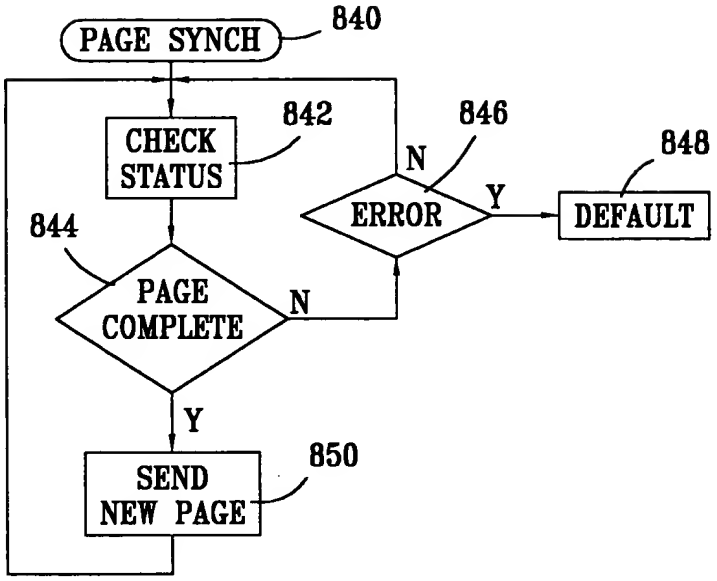
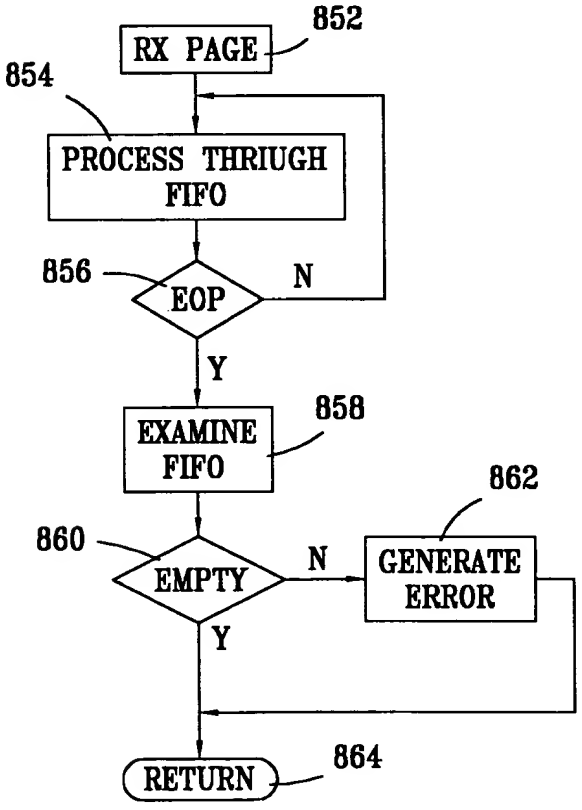

PAGE SYNCH
840
CHECK STATUS
842
ERROR
846
N
Y
DEFAULT
848
PAGE COMPLETE
844
N
Y
SEND NEW PAGE
850

FIG. 38


RX PAGE
852
PROCESS THRIUGH FIFO
854
EOP
856
N
Y
EXAMINE FIFO
858
EMPTY
860
N
GENERATE ERROR
862
Y
RETURN
864

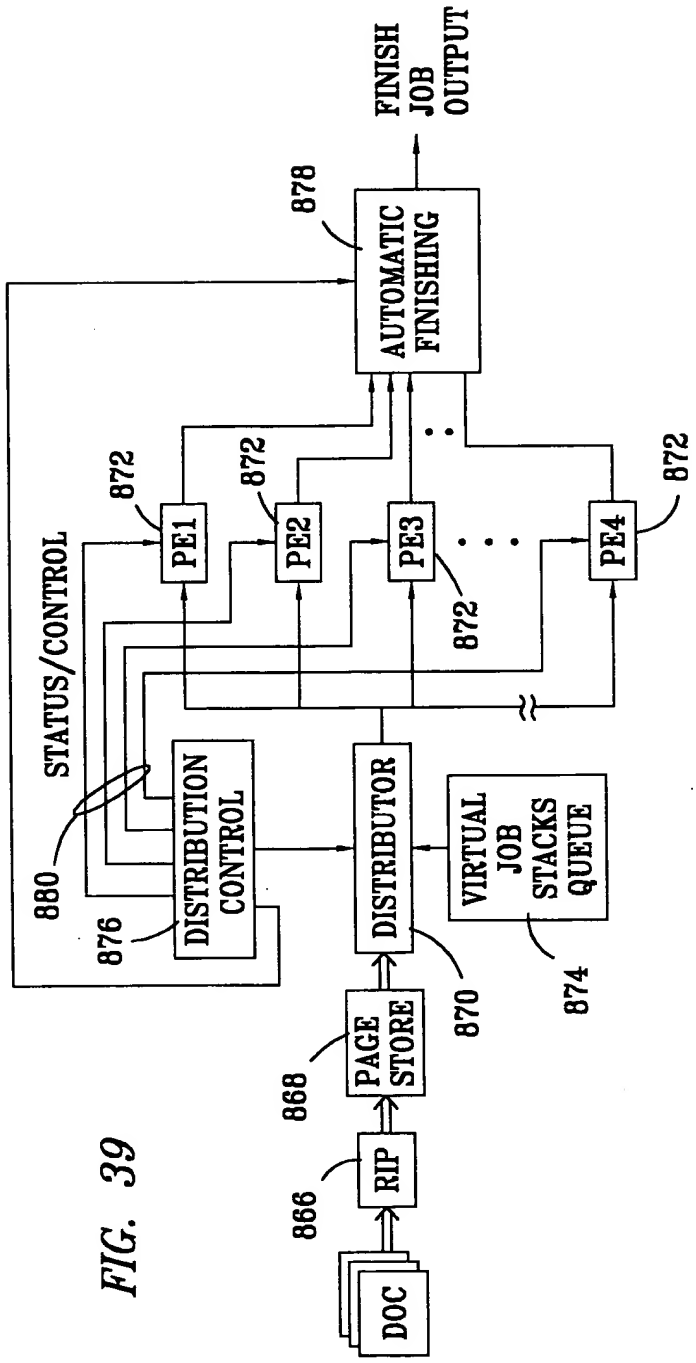
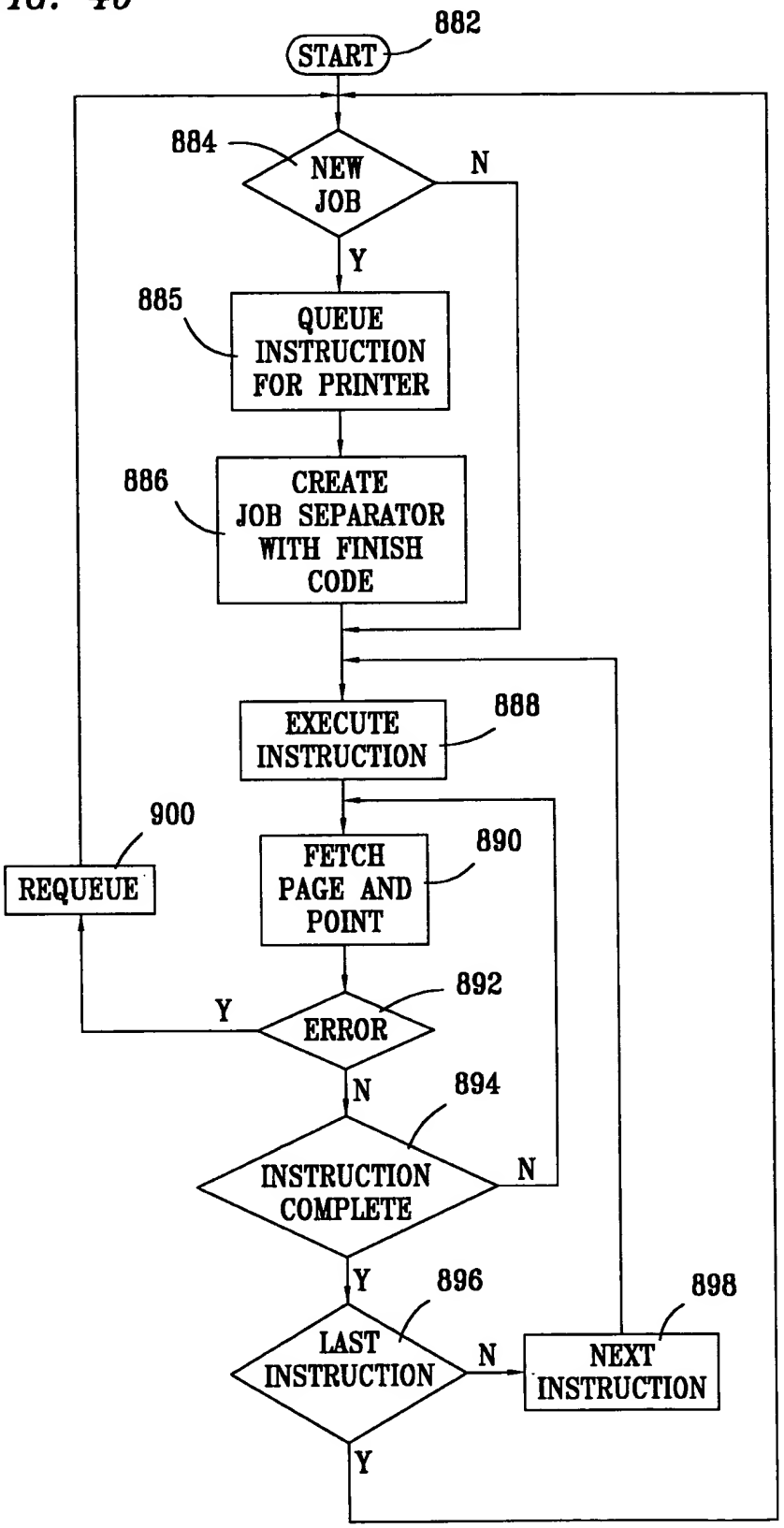

FINISH JOB OUTPUT
878
AUTOMATIC FINISHING
872
PE1
872
PE2
PE3
872
872
PE4
STATUS/CONTROL
880
876
DISTRIBUTION CONTROL
DISTRIBUTOR
VIRTUAL JOB STACKS QUEUE
874
870
868
PAGE STORE
866
RIP
DOC

FIG. 39

FIG. 40


882
START
884
NEW JOB
N
Y
885
QUEUE INSTRUCTION FOR PRINTER
886
CREATE JOB SEPARATOR WITH FINISH CODE
888
EXECUTE INSTRUCTION
900
REQUEUE
890
FETCH PAGE AND POINT
892
ERROR
Y
N
894
INSTRUCTION COMPLETE
N
Y
896
LAST INSTRUCTION
N
898
NEXT INSTRUCTION
Y